

2771-537 CIP

Section I. (Amendments to the Claims)

Please amend claims 1, 43, 45, 49-52, 94, 95, and 100-102, cancel claims 40, 47, 91, 98, 107 and 108, and add claims 116-126, as set out below in the listing of claims 1-126 of the application.

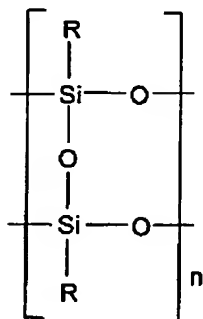
1. (Currently Amended) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a precursor of the material to be deposited on the substrate, wherein said precursor includes a metal atom, and wherein said material to be deposited comprises a material selected from the group consisting of high-k material, copper diffusion barrier material, nitride material, metal nitride material, barrier layer material, oxynitride barrier layer material, nitride barrier layer material, silicide barrier layer material, and copper seed layer material, with the proviso that when the material to be deposited comprises the copper seed layer material, the precursor comprises at least one copper precursor selected from the group consisting of copper (II) carboxylates, copper (I) cyclopentadienes, copper (I) phenyls, copper (I) amides, and Lewis base adducts of the aforementioned copper (I) species.
2. (Original) The deposition composition of claim 1, wherein the supercritical fluid comprises a fluid selected from the group consisting of: carbon dioxide, oxygen, argon, krypton, xenon, ammonia, methane, ethane, methanol, ethanol, isopropanol, dimethyl ketone, sulfur hexafluoride, carbon monoxide, dinitrogen oxide, forming gas, hydrogen, and mixtures thereof.
3. (Original) The deposition composition of claim 1, wherein the supercritical fluid comprises carbon dioxide.
4. (Original) The deposition composition of claim 1, wherein said composition comprises a co-solvent.
5. (Original) The deposition composition of claim 1, consisting essentially of said supercritical fluid and said precursor.
6. (Original) The deposition composition of claim 1, consisting of said supercritical fluid and

BEST AVAILABLE COPY

2771-537 CIP

said precursor.

7. (Original) The deposition composition of claim 1, wherein said precursor comprises a barrier layer precursor for forming a metal nitride or metal oxynitride barrier layer.
8. (Original) The deposition composition of claim 7, wherein said metal nitride or metal oxynitride comprises at least one metal selected from the group consisting of tantalum, titanium, silicon, tungsten and molybdenum.
9. (Previously Presented) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a silicon precursor of the material to be deposited on the substrate, wherein the silicon precursor comprises a cyclosiloxane.
10. (Previously Presented) The deposition composition of claim 9, wherein said material deposited on the substrate is a low k organosilicate material.
11. (Previously Presented) The deposition composition of claim 9, wherein the cyclosiloxane precursor comprises a siloxane selected from the group consisting of tetramethylcyclotetrasiloxane (TMCTS) and octamethyltetracyclosiloxane (OMCTS).
12. (Currently Amended) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid, a silicon precursor of the material to be deposited on the substrate, and cube monomers, wherein the silicon precursor comprises a silsesquioxane having the formula:



BEST AVAILABLE COPY

2771-537 CIP

wherein each R is independently selected from H, C₁-C₈ alkyl, C₁-C₈ alkenyl, C₆-C₁₀ aryl and C₁-C₈ alkoxy.

13. (Cancelled)
14. (Currently Amended) The deposition composition of claim 12, wherein said material deposited on the substrate is a mesoporous organo-functionalized silsesquioxane (SSQ) material.
15. (Cancelled)
16. (Previously Presented) The deposition composition of claim 12, wherein the cube monomers have epoxy and hexyl groups attached to a same cluster of the monomer.
17. (Previously Presented) The deposition composition of claim 1, wherein said precursor comprises a precursor for forming a high k material on the substrate at deposition temperature below 300°C, said precursor comprising a metal and an organo moiety.
18. (Previously Presented) The deposition composition of claim 17, wherein the metal is selected from the group consisting of Ba, Sr, La, Ti, Zr, Ta and Pb, with the proviso that when the metal is Ti, Ta, or Zr, the organo moiety cannot be C₁-C₈ alkoxides or β -diketonates.
19. (Previously Presented) The deposition composition of claim 17, wherein the organo moiety is selected from the group consisting of C₁-C₈ alkoxides, β -diketonates, carbonates, hydroxides, acetates, formates, nitrates, halides, C₆-C₁₀ aryls, C₁-C₈ alkyls, and mixtures of two or more of the foregoing, with the proviso that when the organo moiety is C₁-C₈ alkoxide or β -diketonate, the metal cannot be Ta, Ti or Zr.
20. (Original) The deposition composition of claim 1, wherein the precursor comprises an organometallic compound selected from the group consisting of tetraphenyl lead and triphenyl bismuth.

BEST AVAILABLE COPY

2771-537 CIP

21. (Original) The deposition composition of claim 1, comprising a solvent/co-solvent species selected from the group consisting of carbon dioxide, water, ammonia and alcohols.
22. (Original) The deposition composition of claim 1, wherein the supercritical fluid comprises ammonia.
23. (Original) The deposition composition of claim 22, wherein the precursor comprises a precursor for forming a nitride material on the substrate.
24. (Original) The deposition composition of claim 23, wherein the precursor has a decomposition temperature below 200°C.
25. (Original) The deposition composition of claim 24, wherein the precursor comprises a non-oxide metal-containing precursor.
26. (Original) The deposition composition of claim 1, wherein the supercritical fluid comprises carbon dioxide and the precursor comprises a precursor for forming a metal nitride material on the substrate.
27. (Original) The deposition composition of claim 1, wherein the precursor comprises a precursor for forming a copper diffusion barrier material on the substrate.
28. (Original) The deposition composition of claim 27, wherein the copper diffusion barrier material comprises a material selected from the group consisting of tantalum (Ta), tantalum nitride (TaN_x), tantalum silicon nitride ($TaSiN$), titanium nitride (TiN_x), titanium silicon nitride ($TiSiN$), tungsten nitride (WN_x) and molybdenum nitride (MoN_x), wherein x is equal to the valency of the metal species in the nitride compound.
29. (Original) The deposition composition of claim 27, wherein the copper diffusion barrier material comprises an amorphous material.
30. (Original) The deposition composition of claim 28, wherein the copper diffusion barrier material comprises an amorphous material.

BEST AVAILABLE COPY

2771-537 CIP

31. (Original) The deposition composition of claim 28, wherein the copper diffusion barrier material comprises a material selected from the group consisting of (TaN_x) and titanium nitride (TiN_x) .
32. (Original) The deposition composition of claim 28, wherein the copper diffusion barrier material comprises TaSiN.
33. (Original) The deposition composition of claim 28, wherein the copper diffusion barrier material comprises a material selected from the group consisting of tungsten nitride (WN_x) and molybdenum nitride (MoN_x) .
34. (Previously Presented) The deposition composition of claim 1, wherein the material comprises a barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal alkylamides and metal carbonyls.
35. (Previously Presented) The deposition composition of claim 1, wherein the material comprises a barrier layer material and the precursor comprises at least one precursor selected from the group consisting of tantalum (V) tetraethoxyacetylacetonate; tantalum (V) (tetraethoxy); tris(2,2,6,6-tetramethyl-3,5-heptanedionato) titanium (III); tantalum (V) trifluoroethoxide; pentakis(dimethylamino) tantalum (V); pentakis(ethyl-methylamino) tantalum (V); tetrakis(diethylamino) titanium; tetrakis(dimethylamino) titanium; $\text{Mo}(\text{CO})_6$ and $\text{W}(\text{CO})_6$.
36. (Original) The deposition composition of claim 1, wherein the material comprises an oxynitride barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal β -diketonates and metal alkoxides.
37. (Original) The deposition composition of claim 1, wherein the material comprises a nitride barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal alkylamides.
38. (Original) The deposition composition of claim 1, wherein the material comprises a silicide barrier layer material and the precursor comprises at least one silicon-containing precursor.

2771-537 CIP

39. (Original) The deposition composition of claim 38, wherein the at least one silicon-containing precursor comprises a precursor species selected from the group consisting of silane and t-butyl silane.
40. (Cancelled) ~~The deposition composition of claim 1, wherein the material comprises a copper seed layer material and the precursor comprises at least one copper precursor selected from the group consisting of copper (II) carboxylates, copper (I) cyclopentadienes, copper (I) phenyls, copper (I) amides, and Lewis base adducts of the aforementioned copper (I) species.~~
41. (Previously Presented) The deposition composition of claim 1, wherein the precursor comprises a metal complex including at least one ligand selected from the group consisting of carboxylates, cyclopentadiene, phenyls, and amides.
42. (Original) The deposition composition of claim 41, wherein the metal complex is fluorine-free.
43. (Currently Amended) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a precursor of the material to be deposited on the substrate. ~~The deposition composition of claim 1,~~ wherein the precursor comprises at least one copper precursor selected from the group consisting of

- (1) Cu(pentafluorophenyl) pentamer
- (2) Cu(thd)₂
- (3) Cu(dmhd)₂
- (4) Cu(bzac)₂
- (5) Cu(CHB)₂
- (6) Cu(oxalate)
- (7) Cu(formate)₂
- (8) Cu(acetate)₂
- (9) (VTMS)Cu(hfac)
- (10) Cu(tod)₂
- (11) CpCuPMe₃

BEST AVAILABLE COPY

2771-537 CIP

- (12) $\text{Cu}(\text{dibm})_2$
 (13) $(\text{CO})\text{CuCl}$
~~(14) $\text{Cu}(\text{hfac})_3 \cdot \text{H}_2\text{O}$~~
 (15) $(\text{VCH})\text{Cu}(\text{hfac})$
~~(16) $\text{Cu}(\text{tfbzm})_2$~~
 (17) $(\text{MHY})\text{Cu}(\text{hfac})$
 (18) $(\text{COD})\text{Cu}(\text{hfac})$
 (19) $(\text{DMCOD})\text{Cu}(\text{hfac})$

wherein:

bzac = 1-phenylpentane-1,3-dionate

COD = cyclooctadiene

dibm = 2,6-dimethylheptane-3,5-dionate

dmhd = 1,1-dimethylhexane-3,5-dionate

MHY = 2-methyl-1-hexene-3-yne

tfbzm = 1,1,1-trifluoro-4-phenylbutane-2,4-dionate

thd = 2,2,6,6-tetramethylheptane-3,5-dionate

tod = 2,2,7-trimethyloctane-3,5-dionate

VCH = vinylcyclohexane

CHB = cyclohexanebutyrate

VTMS = vinyltrimethylsilane.

44. (Previously Presented) The deposition composition of claim 1, wherein the precursor comprises a copper (II) precursor, and the composition further comprises isopropyl alcohol.
45. (Currently Amended) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a precursor of the material to be deposited on the substrate. The deposition composition of claim 1, wherein the material to be formed on the substrate consists essentially of a noble metal and/or a noble metal oxide, and wherein the precursor comprises a metal precursor selected from the group consisting of

(i) metal carbonyls;

(ii) metal $(\beta\text{-diketonate})_x \cdot \text{L}$ wherein $x = 1, 2$ or 3 and $\text{L} = \text{Lewis base ligand}$; and

BEST AVAILABLE COPY

2771-537 CIP

(iii) mixed ligand compounds.

46. (Previously Presented) The deposition composition of claim 45, wherein the noble metal and/or noble metal oxide comprises a metal/metal oxide species selected from the group consisting of platinum (Pt), iridium oxide (IrO₂), ruthenium oxide (RuO₂), palladium (Pd), and silver (Ag).

47. (Cancelled) ~~The deposition composition of claim 45, wherein the precursor comprises a metal precursor selected from the group consisting of~~

~~(i) metal carbonyls;~~

~~(ii) metal (β -diketonate)_x•L wherein x = 1, 2 or 3 and L = Lewis base ligand; and~~

~~(iii) mixed ligand compounds.~~

48. (Cancelled)

49. (Currently Amended) The deposition composition of claim 45 [[47]], wherein the supercritical fluid comprises supercritical carbon dioxide.

50. (Currently Amended) The deposition composition of claim 45 [[47]], wherein the metal (β -diketonate)_x•L precursor comprises

(1,5-cyclooctadiene)Ir(I)(acac);

tris(norbornadiene)Ir(III)(acac);

(vinyltriethylsilane)Ag(I)(hexafluoroacetylacetonato); and

bis(2,2,6,6-tetramethyl-3,5-heptanedionato)Ru(II)(1,5-cyclooctadiene).

51. (Currently Amended) The deposition composition of claim 45 [[47]], wherein the precursor

BEST AVAILABLE COPY

2771-537 CIP

comprises a mixed ligand composition including a compound selected from the group consisting of

$(\text{CH}_3)_2\text{Au(III)(acac)}$;

tetrakis-(triphenylphosphine)platinum (0);

trimethyl-methylcyclopentadienyl platinum (IV); and

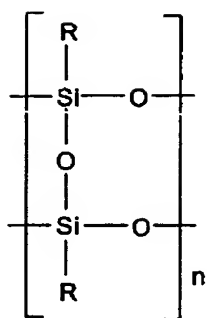
tricarbonyl-methylcyclopentadienyl platinum (I).

52. (Currently Amended) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a precursor of said material, and a supercritical fluid, wherein said precursor includes a metal atom, and wherein said material to be deposited comprises a material selected from the group consisting of high-k material, copper diffusion barrier material, nitride material, metal nitride material, barrier layer material, oxynitride barrier layer material, nitride barrier layer material, silicide barrier layer material, and copper seed layer material, with the proviso that when the material to be deposited comprises the copper seed layer material, the precursor comprises at least one copper precursor selected from the group consisting of copper (II) carboxylates, copper (I) cyclopentadienes, copper (I) phenyls, copper (I) amides, and Lewis base adducts of the aforementioned copper (I) species.
53. (Original) The method of claim 52, wherein the supercritical fluid comprises a fluid selected from the group consisting of: carbon dioxide, oxygen, argon, krypton, xenon, ammonia, methane, ethane, methanol, ethanol, isopropanol, dimethyl ketone, sulfur hexafluoride, carbon monoxide, dinitrogen oxide, forming gas, hydrogen, and mixtures thereof.
54. (Original) The method of claim 52, wherein the supercritical fluid comprises carbon dioxide.
55. (Original) The method of claim 52, wherein said composition comprises a co-solvent.

2771-537 CIP

56. (Original) The method of claim 52, wherein the deposition composition consists essentially of said supercritical fluid and said precursor.
57. (Original) The method of claim 52, wherein the deposition composition consists of said supercritical fluid and said precursor.
58. (Original) The method of claim 52, wherein said precursor comprises a barrier layer precursor for forming a metal nitride or metal oxynitride barrier layer.
59. (Original) The method of claim 58, wherein said metal nitride or metal oxynitride comprises at least one metal selected from the group consisting of tantalum, titanium, silicon, tungsten and molybdenum.
60. (Previously Presented) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a silicon precursor of said material and a supercritical fluid, wherein the silicon precursor comprises a cyclosiloxane.
61. (Previously Presented) The method of claim 60, wherein said material deposited on the substrate is a low k organosilicate material.
62. (Previously Presented) The method of claim 60, wherein the cyclosiloxane precursor comprises a siloxane selected from the group consisting of tetramethylcyclotetrasiloxane (TMCTS) and octamethyltetracyclosiloxane (OMCTS).
63. (Currently Amended) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a silicon precursor of said material, a supercritical fluid, and cube monomers, wherein the silicon precursor comprises a silsesquioxane having the formula:

2771-537 CIP



wherein each R is independently selected from H, C₁-C₈ alkyl, C₁-C₈ alkenyl, C₆-C₁₀ aryl and C₁-C₈ alkoxy.

64. (Cancelled)

65. (Currently Amended) The method of claim 63, wherein said material deposited on the substrate is a mesoporous organo-functionalized silsesquioxane (SSQ) material.

66. (Cancelled)

67. (Previously Presented) The method of claim 63, wherein cube monomers have epoxy and hexyl groups attached to a same cluster of the monomer.

68. (Previously Presented) The method of claim 52, wherein said precursor comprises a precursor for forming a high k material on the substrate at deposition temperature below 300°C, said precursor comprising a metal and an organo moiety.

69. (Previously Presented) The method of claim 68, wherein the metal is selected from the group consisting of Ba, Sr, La, Ti, Zr, Ta and Pb, with the proviso that when the metal is Ti, Ta, or Zr, the organo moiety cannot be C₁-C₈ alkoxides or β-diketonates.

70. (Previously Presented) The method of claim 68, wherein the organo moiety is selected from the group consisting of C₁-C₈ alkoxides, β-diketonates, carbonates, hydroxides, acetates, formates, nitrates, halides, C₆-C₁₀ aryls, C₁-C₈ alkyls, and mixtures of two or more of the foregoing, with the proviso that when the organo moiety is C₁-C₈ alkoxide or β-diketonate,

2771-537 CIP

the metal cannot be Ta, Ti or Zr.

71. (Original) The method of claim 52, wherein the precursor comprises an organometallic compound selected from the group consisting of tetraphenyl lead and triphenyl bismuth.
72. (Original) The method of claim 52, comprising a solvent/co-solvent species selected from the group consisting of carbon dioxide, water, ammonia and alcohols.
73. (Original) The method of claim 52, wherein the supercritical fluid comprises ammonia.
74. (Original) The method of claim 52, wherein the precursor comprises a precursor for forming a nitride material on the substrate.
75. (Original) The method of claim 74, wherein the precursor has a decomposition temperature below 200°C.
76. (Original) The method of claim 75, wherein the precursor comprises a non-oxide metal-containing precursor.
77. (Original) The method of claim 52, wherein the supercritical fluid comprises carbon dioxide and the precursor comprises a precursor for forming a metal nitride material on the substrate.
78. (Original) The method of claim 52, wherein the precursor comprises a precursor for forming a copper diffusion barrier material on the substrate.
79. (Original) The method of claim 78, wherein the copper diffusion barrier material comprises a material selected from the group consisting of tantalum (Ta), tantalum nitride (TaN_x), tantalum silicon nitride ($TaSiN$), titanium nitride (TiN_x), titanium silicon nitride ($TiSiN$), tungsten nitride (WN_x) and molybdenum nitride (MoN_x), wherein x is equal to the valency of the metal species in the nitride compound.
80. (Original) The method of claim 78, wherein the copper diffusion barrier material comprises

2771-537 CIP

an amorphous material.

81. (Original) The method of claim 79, wherein the copper diffusion barrier material comprises an amorphous material containing silicon.
82. (Original) The method of claim 79, wherein the copper diffusion barrier material comprises a material selected from the group consisting of (TaN_x) and titanium nitride (TiN_x).
83. (Original) The method of claim 79, wherein the copper diffusion barrier material comprises TaSiN.
84. (Original) The method of claim 79, wherein the copper diffusion barrier material comprises a material selected from the group consisting of tungsten nitride (WN_x) and molybdenum nitride (MoN_x).
85. (Previously Presented) The method of claim 52, wherein the material comprises a barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal alkylamides and metal carbonyls.
86. (Previously Presented) The method of claim 52, wherein the material comprises a barrier layer material and the precursor comprises at least one precursor selected from the group consisting of tantalum (V) tetraethoxyacetylacetonate; tantalum (V) (tetraethoxy); tris(2,2,6,6-tetramethyl-3,5-heptanedionato) titanium (III); tantalum (V) trifluoroethoxide; pentakis(dimethylamino) tantalum (V); pentakis(ethyl-methylamino) tantalum (V); tetrakis(diethylamino) titanium; tetrakis(dimethylamino) titanium; $Mo(CO)_6$ and $W(CO)_6$.
87. (Original) The method of claim 52, wherein the material comprises an oxynitride barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal β -diketonates and metal alkoxides.
88. (Original) The method of claim 52, wherein the material comprises a nitride barrier layer material and the precursor comprises at least one precursor selected from the group consisting of metal alkylamides.

BEST AVAILABLE COPY

2771-537 CIP

89. (Original) The method of claim 52, wherein the material comprises a silicide barrier layer material and the precursor comprises at least one silicon-containing precursor.
90. (Original) The method of claim 89, wherein the at least one silicon-containing precursor comprises a precursor species selected from the group consisting of silane and t-butyl silane.
91. (Cancelled) ~~The method of claim 52, wherein the material comprises a copper seed layer material and the precursor comprises at least one copper precursor selected from the group consisting of copper (II) carboxylates, copper (I) cyclopentadienes, copper (I) phenyls, copper (I) amides, and Lewis base adducts of the aforementioned copper (I) species.~~
92. (Previously Presented) The method of claim 52, wherein the precursor comprises a metal complex including at least one ligand selected from the group consisting of carboxylates, cyclopentadiene, phenyls, and amides.
93. (Original) The method of claim 92, wherein the metal complex is fluorine-free.
94. (Currently Amended) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a precursor of said material, and a supercritical fluid. ~~The method of claim 52,~~ wherein the precursor comprises at least one copper precursor selected from the group consisting of

- (1) Cu(pentafluorophenyl) pentamer
- (2) Cu(thd)₂
- (3) Cu(dmhd)₂
- (4) Cu(bzac)₂
- (5) Cu(CHB)₂
- (6) Cu(oxalate)
- (7) Cu(formate)₂
- (8) Cu(acetate)₂
- (9) (VTMS)Cu(hfac)
- (10) Cu(tod)₂
- (11) CpCuPMe₃

BEST AVAILABLE COPY

2771-537 CIP

- (12) $\text{Cu}(\text{dibm})_2$
 (13) $(\text{CO})\text{CuCl}$
~~(14) $\text{Cu}(\text{hfac})_2 \cdot \text{H}_2\text{O}$~~
~~(15) (14) $(\text{VCH})\text{Cu}(\text{hfac})$~~
~~(16) (15) $\text{Cu}(\text{tfbzm})_2$~~
~~(17) (16) $(\text{MHY})\text{Cu}(\text{hfac})$~~
~~(18) (17) $(\text{COD})\text{Cu}(\text{hfac})$~~
~~(19) (18) $(\text{DMCOD})\text{Cu}(\text{hfac})$~~

wherein:

bzac = 1-phenylpentane-1,3-dionate

COD = cyclooctadiene

dibm = 2,6-dimethylheptane-3,5-dionate

dmhd = 1,1-dimethylhexane-3,5-dionate

MHY = 2-methyl-1-hexene-3-yne

tfbzm = 1,1,1-trifluoro-4-phenylbutane-2,4-dionate

thd = 2,2,6,6-tetramethylheptane-3,5-dionate

tod = 2,2,7-trimethyloctane-3,5-dionate

VCH = vinylcyclohexane

CHB = cyclohexanebutyrate

VTMS = vinyltrimethylsilane.

95. (Previously Presented) The method of claim 52, wherein the precursor comprises a copper (II) precursor, and the composition further comprises isopropyl alcohol.
96. (Currently Amended) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a precursor of said material, and a supercritical fluid ~~The method of claim 52,~~ wherein the material to be formed on the substrate consists essentially of a noble metal and/or a noble metal oxide, and wherein the precursor comprises a metal precursor selected from the group consisting of

(i) metal carbonyls;

(ii) metal $(\beta\text{-diketonate})_x \cdot \text{L}$ wherein $x = 1, 2$ or 3 and $\text{L} = \text{Lewis base ligand}$; and

2771-537 CIP

(iii) mixed ligand compounds.

97. (Previously Presented) The method of claim 96, wherein the noble metal and/or noble metal oxide comprises a metal/metal oxide species selected from the group consisting of platinum (Pt), iridium oxide (IrO₂), ruthenium oxide (RuO₂), palladium (Pd), and silver (Ag).

98. (Cancelled) ~~The method of claim 97, wherein the precursor comprises a metal precursor selected from the group consisting of~~

~~(i) metal carbonyls;~~

~~(ii) metal (β -diketonate)_xL, wherein x = 1, 2 or 3 and L = Lewis base ligand; and~~

~~(iii) mixed ligand compounds.~~

99. (Cancelled)

100. (Currently Amended) The method of claim 96 [[99]], wherein the supercritical fluid comprises supercritical carbon dioxide.

101. (Currently Amended) The method of claim 96 [[98]], wherein the metal (β -diketonate)_xL precursor comprises

(1,5-cyclooctadiene)Ir(I)(acac);

tris(norbornadiene)Ir(III)(acac);

(vinyltriethylsilane)Ag(I)(hexafluoroacetylacetonato); and

bis(2,2,6,6-tetramethyl-3,5-heptanedionato)Ru(II)(1,5-cyclooctadiene).

102. (Currently Amended) The method of claim 96 [[98]], wherein the precursor comprises a mixed ligand composition including a compound selected from the group consisting of

2771-537 CIP

$(\text{CH}_3)_2\text{Au(III)(acac)}$;

tetrakis-(triphenylphosphine)platinum (0);

trimethyl-methylcyclopentadienyl platinum (IV); and

tricarbonyl-methylcyclopentadienyl platinum (I).

103. (Original) A method of forming a low k organosilicate film on a substrate, comprising contacting the substrate with a deposition composition comprising an organosilicon compound and a supercritical fluid, to deposit a silicon-containing material on the substrate, and vitrifying the silicon-containing material to form said low k organosilicate film as a porous organosilicate film on the substrate.
104. (Original) The method of claim 103, comprising controlling the porosity of the porous organosilicate film to yield the porous organosilicate film as a film having a predetermined dielectric constant.
105. (Original) The method of claim 104, wherein porosity is controlled by controlled incorporation of air bubbles in the silicon-containing material deposited on the substrate.
106. (Original) A method of forming a barrier layer on a substrate, comprising contacting the substrate in a contacting zone with a deposition composition comprising a barrier layer precursor and a supercritical fluid, and continuing said contacting while flowing the deposition composition into the contacting zone, and discharging contacted deposition composition from said contacting zone, to effect growth of the barrier layer to a predetermined thickness.
107. (Cancelled) ~~A method of metallizing a semiconductor substrate comprising contacting the substrate with a copper metallization precursor in a supercritical fluid, to deposit copper on the substrate.~~
108. (Cancelled) ~~A method of forming electrodes on a semiconductor substrate comprising~~

BEST AVAILABLE COPY

2771-537 CIP

~~contacting the substrate with an electrode material precursor in a supercritical fluid, to deposit electrode material on the substrate.~~

109. (Previously Presented) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a precursor of the material to be deposited on the substrate, wherein said precursor is selected from the group consisting of: a barrier layer precursor for forming a metal nitride barrier layer; a barrier layer precursor for forming a metal silicon nitride barrier layer; a barrier layer precursor for forming a metal oxynitride barrier layer; a precursor for forming a high k material on the substrate at deposition temperature below 300°C; tetraphenyl lead; triphenyl bismuth; a precursor for forming a copper diffusion barrier material on the substrate; and at least one copper precursor selected from the group consisting of copper (II) carboxylates, copper (I) cyclopentadienes, copper (I) phenyls, copper (I) amides, and Lewis base adducts of the aforementioned copper (I) species.
110. (Previously Presented) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a silicon precursor, wherein the silicon precursor comprises at least one siloxane and at least one alkylsilane.
111. (Previously Presented) The deposition composition of claim 110, wherein the alkylsilane comprises a silane selected from the group consisting of trimethylsilane and tetramethylsilane.
112. (Previously Presented) The deposition composition of claim 110, wherein the silicon precursor comprises a siloxane, and the composition further comprises a porogen effective in combination with the siloxane to form a porous low k film on the substrate.
113. (Previously Presented) A method of forming a material on a substrate, comprising depositing the material on the substrate from a deposition composition comprising a silicon precursor, and a supercritical fluid, wherein the silicon precursor comprises at least one siloxane and at least one alkylsilane.
114. (Previously Presented) The method of claim 113, wherein the alkylsilane comprises a

2771-537 CIP

silane selected from the group consisting of trimethylsilane and tetramethylsilane.

115. (Previously Presented) The method of claim 113, wherein the silicon precursor comprises a siloxane, and the composition further comprises a porogen effective in combination with the siloxane to form a porous low k film on the substrate.
116. (New) A deposition composition for depositing material on a substrate, said deposition composition comprising a supercritical fluid and a precursor of the material to be deposited on the substrate, wherein said precursor comprises a metal complex including at least one ligand selected from the group consisting of carboxylates, cyclopentadiene, phenyls, and amides.
117. (New) The deposition composition of claim 9, further comprising a porogen.
118. (New) The deposition composition of claim 117, wherein said material deposited on the substrate is a porous low k film precursor.
119. (New) The method of claim 60, wherein the deposition composition further comprises a porogen.
120. (New) The method of claim 119, wherein said material deposited on the substrate is a porous low k film precursor.
121. (New) The method of claim 120, further comprising treating said material deposited on said substrate to form a porous low k film.
122. (New) A method of manufacturing a semiconductor comprising depositing a material on a substrate using the deposition composition of claim 1, wherein said semiconductor comprises said substrate.
123. (New) A method of manufacturing a semiconductor comprising depositing a material on a substrate using the deposition composition of claim 9, wherein said semiconductor comprises said substrate.

BEST AVAILABLE COPY

2771-537 CIP

124. (New) A method of manufacturing a semiconductor comprising depositing a material on a substrate using the deposition composition of claim 12, wherein said semiconductor comprises said substrate.
125. (New) A method of manufacturing a semiconductor comprising depositing a material on a substrate using the deposition composition of claim 43, wherein said semiconductor comprises said substrate.
126. (New) A method of manufacturing a semiconductor comprising depositing a material on a substrate using the deposition composition of claim 45, wherein said semiconductor comprises said substrate.

BEST AVAILABLE COPY